

Advanced Oxygen Evolution Catalysts for PEM Electrolyzers, Phase II

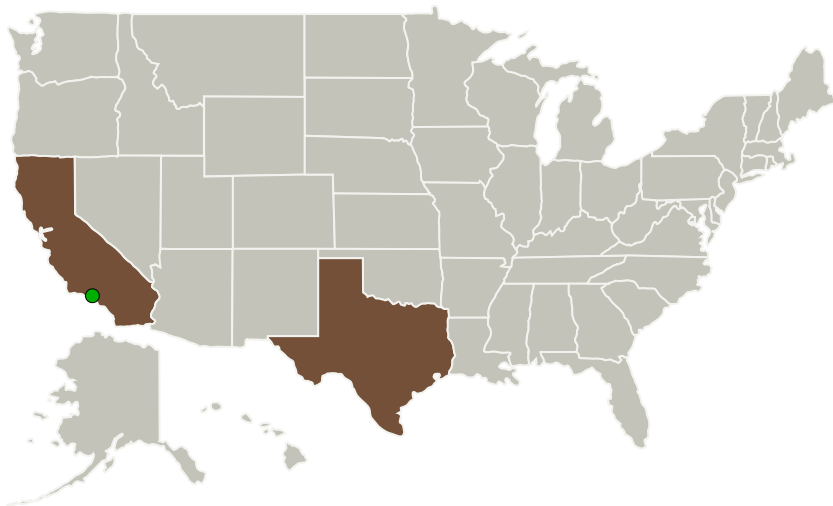
Completed Technology Project (2011 - 2013)



Project Introduction

Future NASA missions require high efficiency, lightweight, long life, and maintenance-free water electrolyzer technologies to generate oxygen and/or hydrogen for energy storage, propulsion, life-support systems, cabin-oxygen replenishment, and zero-g science activities. International Space Station, future Lunar and Martian Outposts, and future exploration vehicles require high efficiency electrolyzers to improve their operational capabilities for long and complex missions. The oxygen evolution reaction is the limiting step due to non-optimal electrocatalyst structure. State-of-the-art electrocatalysts do not meet MEA efficiency and lifetime requirements for NASA applications. Advanced electrocatalysts are needed. In the Phase I, Lynntech manufactured a binary nanoparticle surface decorated mixed oxide electrocatalyst with the optimal microstructure and demonstrated an MEA efficiency of >90% (i.e., an electrolysis potential of 1.358 V/cell) at 200 mA/cm². In the Phase II program, Lynntech will investigate different catalyst morphologies to improve the lifetime. In addition, ternary transition metal oxides will be incorporated into the mixed oxide to further increase the efficiency and lifetime. The applicability of this advanced catalyst to different membranes will be investigated. Nanocomposite membranes with low hydrogen gas cross-over will be manufactured and tested. A short electrolyzer stack will be assembled with the optimized components, tested and delivered to NASA.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Texas

Project Transitions

**June 2011:** Project Start**May 2013:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138791>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Lynntech, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

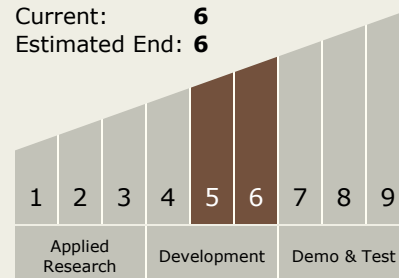
Carlos Torrez

Principal Investigator:

Alan Cisar

Technology Maturity (TRL)

Start: 5
 Current: 6
 Estimated End: 6



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.2 Energy Storage
 - └ TX03.2.2 Electrochemical: Fuel Cells

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System